PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
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PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Rule 71.1)

Date of mailing *(day/month/year)*	09 MAY 2007
Applicant's or agent's file reference 030262WO	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US05/03156	31 January 2005 (31.01.2005)	05 February 2004 (05.02.2004)

Applicant

QUALCOMM INCORPORATED

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the *PCT Applicant's Guide.*

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed invention is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Eugene Yun Telephone No. (571) 272-7860

Form PCT/IPEA/416 (January 2004)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant' s or agent' s file reference 030262WO	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/US05/03156	International filing date *(day/month/year)* 31 January 2005 (31.01.2005)	Priority date *(day/month/year)* 05 February 2004 (05.02.2004)
International Patent Classification (IPC) or national classification and IPC IPC: **H04L 25/02** H04B 3/20 USPC: 370/286,289,290,343,347		
Applicant QUALCOMM INCORPORATED		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *(sent to the applicant and to the International Bureau)* a total of ___ sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) ____ , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
06 September 2005 (06.09.2005)	05 February 2007 (05.02.2007)
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Eugene Yun Telephone No. (571) 272-7860

Form PCT/IPEA/409 (cover sheet)(April 2005)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US05/03156

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into English, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))

☐ publication of the international application (under Rule 12.4(a))

☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☒ the international application as originally filed/furnished

☒ the description:
pages 1-24 as originally filed/furnished
pages* NONE received by this Authority on
pages* NONE received by this Authority on

☒ the claims:
pages 25-31 as originally filed/furnished
pages* NONE as amended (together with any statement) under Article 19
pages* NONE received by this Authority on
pages* NONE received by this Authority on

☒ the drawings:
pages 1-7 as originally filed/furnished
pages* NONE received by this Authority on
pages* NONE received by this Authority on

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages
☐ the claims, Nos.
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages
☐ the claims, Nos.
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

** If item 4 applies, some or all of those sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 15, 16, and 23-26	YES
	Claims 1-14, 17-22, and 27-34	NO
Inventive Step (IS)	Claims NONE	YES
	Claims 1-34	NO
Industrial Applicability (IA)	Claims 1-34	YES
	Claims NONE	NO

2. Citations and Explanations (Rule 70.7)
Please See Continuation Sheet

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

V. 2. Citations and Explanations:

Claims 1-14, 17-22, and 27-34 lack novelty under PCT Article 33(2) as being anticipated by Cioffi et al. (US 5,995,567).

Referring to Claim 1, Cioffi teaches a method of recovering first and second data streams transmitted simultaneously via a wireless channel in a wireless communication system, comprising:

deriving a first channel estimate for the wireless channel based on received symbols (see col. 5, lines 54-57);

performing detection for the first data stream using the first channel estimate (see col. 5, lines 58-64);

deriving a second channel estimate based on the detected first data stream (see col. 5, line 65 to col. 6, line 4);

deriving a third channel estimate based on the first and second channel estimates (see col. 6, lines 5-14); and

performing detection for the second data stream using the third channel estimate (see col. 6, lines 14-20).

Claim 30 has similar limitations as Claim 1.

Referring to Claim 2, Cioffi also teaches the first channel estimate for the wireless channel is derived based on received pilot symbols (see col. 5, lines 47-53).

Referring to Claims 3 and 31, Cioffi also teaches estimating interference due to the first data stream using the third channel estimate, and wherein the detection for the second data stream is performed with the estimated interference from the first data stream canceled (see col. 6, lines 36-42).

Referring to Claim 4, Cioffi also teaches the first and second data streams are combined prior to transmission via the wireless channel (see col. 9, lines 1-9).

Referring to Claim 5, Cioffi also teaches deriving the first channel estimate including obtaining a frequency response estimate for the wireless channel based on the received pilot symbols (see col. 12, lines 14-18),

deriving a time-domain impulse response estimate for the wireless channel based on the frequency response estimate (see

Supplemental Box

col. 11, lines 10-18), and

deriving the first channel estimate based on the time-domain impulse response estimate (see col. 11, lines 18-22).

Referring to Claim 6, Cioffi also teaches the time-domain impulse response estimate derived by performing an inverse fast Fourier transform (IFFF) on the frequency response estimate, and wherein the first channel estimate is derived by performing a fast Fourier transform (FFF) on the time-domain impulse response estimate (see col. 1, lines 44-50).

Referring to Claim 7, Cioffi also teaches deriving the second channel estimate including obtaining a frequency response estimate for the wireless channel based on the received pilot symbols (see col. 12, lines 14-18),

deriving a time-domain impulse response estimate for the wireless channel based on the frequency response estimate (see col. 11, lines 10-18), and

deriving the first channel estimate based on the time-domain impulse response estimate (see col. 11, lines 18-22).

Referring to Claim 8, Cioffi also teaches the first and second channel estimates as time-domain impulse response estimates, and wherein the third channel estimate is a frequency response estimate derived by combining and transforming the time-domain impulse response estimates for the first and second channel estimates (see col. 11, lines 18-22).

Referring to Claim 9, Cioffi also teaches the first channel estimate comprising channel gain estimates for a first group of subbands and the second channel estimate comprises channel gain estimates for a second group of subbands, and wherein the third channel estimate is derived based on a concatenation of the channel gain estimates for the first and second groups of subbands (see col. 11, lines 18-22).

Referring to Claim 10, Cioffi also teaches the third channel estimate derived by frequency interpolation of the channel gain estimates for the first and second groups of subbands (see col. 8, lines 50-56).

Referring to Claim 11, Cioffi also teaches the first group of subbands is used for pilot transmission and the second group of subbands is used for data transmission (see col. 7, lines 8-14).

Referring to Claim 12, Cioffi also teaches the detection for the first data stream performed on received data symbols and provides detected symbols for the first data stream (see col. 7, liners 8-14).

Referring to Claims 13 and 32, Cioffi also teaches decoding the detected symbols for the first data stream to obtain decoded data for the first data stream, and re-encoding the decoded data to obtain remodulated symbols for the first data stream, and wherein the second channel estimate is derived based on the remodulated symbols and the received data symbols (see col. 6, lines 8-16).

Referring to Claim 14, Cioffi also teaches mapping the detected symbols for the first data stream to modulation symbols based on a modulation scheme used for the first data stream, and wherein the second channel estimate is derived based on the modulation symbols and the received data symbols (see col. 2, lines 16-25).

Referring to Claim 17, Cioffi also teaches filtering the first channel estimate, and wherein the third channel estimate is derived based on the filtered first channel estimate (see col. 3, line 62 to col. 4, line 3).

Referring to Claim 18, Cioffi also teaches filtering the second channel estimate, and wherein the third channel estimate is derived based on the filtered second channel estimate (see col. 4, lines 17-25).

Referring to Claim 19, Cioffi also teaches filtering the third channel estimate, and wherein the detection for the second data stream is performed using the filtered third channel estimate (see col. 4, lines 17-25).

Referring to Claim 20, Cioffi also teaches filtering the first, second, or third channel estimate in time domain or frequency domain (see col. 4, lines 17-25).

Referring to Claim 21, Cioffi also teaches an infinite impulse response filter (see col. 4, lines 17-25 noting that an IIR filter is well known in the art).

Referring to Claim 22, Cioffi also teaches a finite impulse response filter (see col. 4, lines 17-25 noting that an FIR filter is well known in the art).

Referring to Claim 27, Cioffi teaches an apparatus operable to recover first and second data streams transmitted simultaneously via a wireless channel in a wireless communication system, comprising:

a channel estimator operative to derive a first channel estimate for the wireless channel based on received symbols (see col. 5, lines 54-57), derive a second channel estimate based on detected symbols for the first data stream (see col. 5, line 65 to col. 6, line 4), and derive a third channel estimate based on the first and second channel estimates (see col. 6, lines 5-14); and

a detector operative to perform detection for the first data stream using the first channel estimate (see col. 5, lines 58-64), provide the detected symbols for the first data stream, perform detection for the second data stream using the third channel estimate, and provide detected symbols for the second data stream (see col. 6, lines 14-20).

Referring to Claim 28, Cioffi also teaches the detector further operative to estimate interference due to the first data stream using the third channel estimate and to perform detection for the second data stream with the estimated interference from the first data stream canceled (see col. 6, lines 36-42).

Referring to Claim 29, Cioffi also teaches a receive data processor operative to decode the detected symbols for the first data stream to obtain decoded data for the first data stream and to re-encode the decoded data to obtain remodulated symbols for the first data stream, and wherein the channel estimator is operative to derive the second channel estimate based on the remodulated symbols and received data symbols (see col. 6, lines 8-16).

Referring to Claim 33, Cioffi teaches a method of recovering a base stream and an enhancement stream transmitted simultaneously via a wireless channel in a wireless communication system, comprising:

deriving a first channel estimate for the wireless channel based on received pilot symbols (see col. 5, lines 54-57);

performing detection for the base stream using the first channel estimate to obtain detected symbols for the base

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stream (see col. 5, lines 58-64);

decoding the detected symbols for the base stream to obtain decoded data for the base stream (see col. 6, lines 8-16);

re-encoding the decoded data for the base stream to obtain remodulated symbols for the base stream (see col. 6, lines 8-16);

deriving a second channel estimate based on the remodulated symbols (see col. 5, line 65 to col. 6, line 4);

deriving a third channel estimate based on the first and second channel estimates (see col. 6, lines 5-14);

estimating interference due to the base stream using the third channel estimate (see col. 6, lines 14-20);

performing detection for the enhancement stream, with the estimated interference from the base stream canceled and using the third channel estimate, to obtain detected symbols for the enhancement stream (see col. 6, lines 14-20); and

decoding the detected symbols for the enhancement stream to obtain decoded data for the enhancement stream (see col. 6, lines 8-16).

Referring to Claim 34, Cioffi also teaches deriving the first channel estimate including obtaining a frequency response estimate for the wireless channel based on the received pilot symbols (see col. 12, lines 14-18),

deriving a time-domain impulse response estimate for the wireless channel based on the frequency response estimate (see col. 11, lines 10-18), and

deriving the first channel estimate based on the time-domain impulse response estimate (see col. 11, lines 18-22).

Claims 15, 16, and 23-26 lack an inventive step under PCT Article 33(3) as being obvious over Cioffi in view of Isaksson et al. (US 6,181,714).

Referring to Claim 15, Cioffi does not teach the deriving a third channel estimate including scaling the first channel estimate with a first scaling factor, scaling the second channel estimate with a second scaling factor, and combining the scaled first channel estimate and the scaled second channel estimate to obtain the third channel estimate. Isaksson teaches the deriving a third channel estimate including scaling the first channel estimate with a first scaling factor, scaling the second channel estimate with a second scaling factor, and combining the scaled first channel estimate and the scaled second channel estimate to obtain the third channel estimate (see col. 2, lines 51-67). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the teachings of Isaksson to said device of Cioffi in order to ensure better compatibility with high-bandwidth systems.

Refering to Claim 16, Isaksson also teaches the first and second scaling factors selected based on reliability of the first channel estimate relative to reliability of the second channel estimate (see col. 2, lines 51-67).

Refering to Claim 23, Isaksson also teaches the wireless communication system utilizing orthogonal frequency division multiplexing (OFDM) (see col. 2, lines 40-45).

Referring to Claim 24, Isaksson also teaches the received pilot symbols are obtained in each OFDM symbol period and for a set of subbands used for pilot transmission (see col. 12, lines 13-24).

Referring to Claim 25, Isaksson also teaches the received pilot symbols are obtained for OFDM symbol periods used for pilot transmission, wherein the first channel estimate is derived for each OFDM symbol period used for pilot transmission, and wherein the second channel estimate is derived for each OFDM symbol period used for data transmission (see col. 12, lines 13-24).

Referring to Claim 26, Isaksson also teaches the wireless communication system as a multiple-input multiple-output (MIMO) communication system, and wherein the first and second data streams are transmitted simultaneously from a plurality of antennas (see col. 9, lines 20-26).

----------NEW CITATIONS----------

US 5,995,567 A (CIOFFI et al) 30 November 1999 (30.11.1999), column 3, lines 53-67.

US 6,181,714 B1 (ISAKSSON et al) 30 January 2001 (30.01.2001), column 2, lines 51-67.